6.0 RELATIONSHIP BETWEEN THE AMBIENT AND RESIDENTIAL SAMPLING RESULTS

Respirable fraction hi-vol air samples were collected at all four sampling locations around Prospector Square (Figure 2.1). The analysis of these samples can be found in Section 4.2.8. The respirable samples were collected as a measure of the migration of airborne contaminants that may contribute to inhalation exposure in residents living near the site. Sampler PS-AM-12 was collocated with sampler PS-AM-05 at a distance of two hundred feet from the site and was used to determine off-site migration of contaminants. Contaminant levels in PS-AM-13, located adjacent to the site along with PS-AM-03 and PS-AM-04, were compared to those in PS-AM-12 to determine the percentage of contaminant found at the site boundary to that found blowing off-site.

A concern for potential lead exposure in Park City residents has been assessed by ATSDR. The mean soil lead concentration found in the Prospector Square subdivision (zone A) was 110 time the normal lead concentration found in soil in the Western United States (Section 5.2.2). A similar pattern of lead, manganese and zinc concentrations was found between soil samples collected in the Prospector Square subdivision (zone A) and ambient downwind hi-vol air samples collected at Prospector Square, indicating a connection between the two sample types.

6.1 OBSERVED RESPIRABLE AIRBORNE CONTAMINANTS AT PROSPECTOR SQUARE

In total suspended particulate (TSP) samples, a statistically significant elevation in downwind samples was found for copper, ($p>0.05$), lead and zinc ($p>0.10$). The results of the respirable sample analysis confirmed that found in TSP samples; statistically significant results were found in August for lead ($p<0.12$) and zinc ($p<0.07$). When the upwind and downwind sample was compared by combining all three months of data, the significance levels were much higher ($p<0.001$).

6.2 MIGRATION OF CONTAMINANTS FROM THE PROSPECTOR SQUARE SITE

A determination of particulate migration from the Prospector Square site was performed by comparing contaminant concentrations collected at samplers PS-AM-12 and PS-AM-13. The comparison was made for mean contaminant levels and for maximum levels collected when the wind was blowing from the site toward PS-AM-13, located adjacent to the site, and PS-AM-12, located two hundred feet from the site.

As expected, the mean concentrations of both lead and zinc were higher in samples collected at PS-AM-13 than in PS-AM-12. The mean, standard deviation and ninety-five percent confidence interval for the mean for both samplers can be found in Table 22. The means are for all fourteen days of the study. When the mean values were compared for the two samplers, the amount of lead at PS-AM-12 was 59% of that found at PS-AM-13, while zinc was 72.1% of the PS-AM-13 concentration. When wind direction was toward PS-AM-13 and PS-AM-12, on September 30 and October 1, the contaminant concentrations were higher at both samplers than the mean levels for all sampling days. The values on September 30 were: 0.014 $\mu g/m^3$ lead and 0.0181 $\mu g/m^3$ zinc at PS-AM-12; and 0.0217 $\mu g/m^3$ lead and 0.0230 $\mu g/m^3$ zinc at PS-AM-13. On October 1, the concentrations were: 0.0223 $\mu g/m^3$ lead and 0.0278 $\mu g/m^3$ zinc at PS-AM-12; and 0.0342 $\mu g/m^3$ lead and 0.0297 $\mu g/m^3$ zinc at PS-AM-13. A comparison of the contaminant levels collected at the two sampler locations indicated that lead concentration at PS-AM-12 was 66.5 % (64.5 to 68.5%) of that found at PS-AM-13. Zinc concentration at PS-AM-12 was 86.2% (78.7 to 93.6%) of the concentration found at PS-AM-13.

The data collected at PS-AM-12 and PS-AM-13 were used to construct a zone around Prospector Square, two-hundred feet wide, that could be used to predict a contaminant gradient around the site. This contaminant gradient is shown in Figure 9.0. The gradient was used primarily to predict lead and zinc levels within two-hundred feet of sampler PS-AM-11, located on the east side of Prospector Square. The two-hundred foot gradient would include the residences adjoining the site along the east side. The mean respirable lead concentration

detected at PS-AM-11 was 0.0184 $\mu g/m^3$, the mean zinc concentrations was 0.0326 $\mu g/m^3$. PS-AM-11 (collocated with PS-AM-01, Table 4.0) was the primary or secondary downwind sampler on July 27, August 21 and 25, September 30 and October 1 to 4. The mean values for the eight days listed above were higher than the overall means, indicating that more contaminants were blown from the site toward the sampler on these days. The mean lead value was 0.0269 $\mu g/m^3$. The mean zinc concentration was 0.0409 $\mu g/m^3$.

Using the two hundred foot gradient, the predicted zinc and lead levels entering the residential environment on the east side of the site was calculated as follows. The mean lead level was predicted as 0.665 x 0.0184 $\mu g/m^3$ = 0.0122 $\mu g/m3$, while the mean zinc level was 0.862 x 0.0326 $\mu g/m^3$ = 0.0281 $\mu g/m^3$. The mean levels were higher than the overall average on days when the wind direction was toward the residences, lead, 0.665 x 0.0269 $\mu g/m^3$ = 0.0179 $\mu g/m^3$; zinc, 0.862 x 0.0409 $\mu g/m^3$ = 0.0353 $\mu g/m^3$.

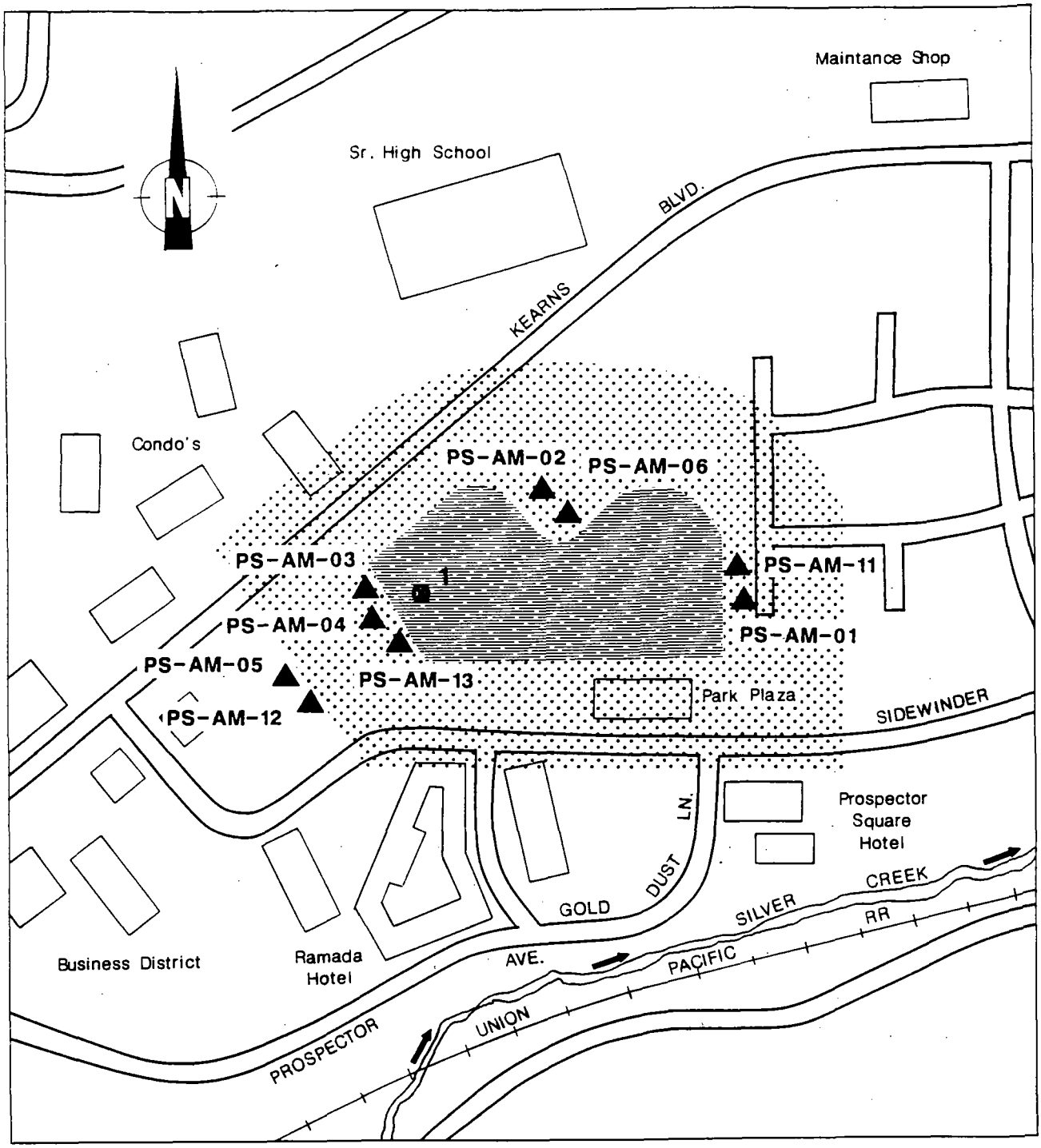
The results indicate that lead and zinc migrated two hundred feet from the site during variable wind direction conditions as well as when the wind direction was toward the sample locations. Therefore contaminants originating from the exposed Prospector Square tailings are likely to have migrated into the residential area along the east side of Prospector Square, in the Prospector Square subdivision. The windblown contaminants may have contributed in a minor way to the elevated levels of lead and zinc found in yard soil samples collected at residences in the Prospector Square subdivisions. Assuming 100% deposition of mean TSP and respirable lead at the 200 foot gradient, aerial deposition could only account for a very small amount. While the highest lead and zinc concentrations were recorded in soil samples collected at houses 4A (PS-SO-4A) and 5A (PS-SO-5A)(Table 12.1), aerial deposition does not explain these concentrations. Both houses are located along the east edge of Prospector Square (Figure 4).

6.3 DATA INTERPRETATION

When interpreting the off-site migration results, it is important to recognize that none of the lead concentrations in airborne dust samples collected in the Prospector Square study exceeded the National Ambient Air Quality Standard (NAAQS) for lead of 1.5 $\mu g/m^3$. In fact, the mean respirable lead concentration at PS-AM-13 is 1/100 of the NAAQS and the mean TSP lead concentration is only 6/1000 of the same standard. There is no ambient air standard for zinc. Therefore, inhalation exposure of residents living near the site appears to be minimal. The airborne migration of contaminants from exposed tailings at Prospector Square has probably contributed in some small amount to residential soil levels. The ingestion of contaminated soil, primarily by young children, may contribute to lead or zinc exposure in residents living adjacent to the Prospector Square site, but the majority of the contamination has not been transported by air.

TABLE 22: COMPARISON OF LEAD AND ZINC CONCENTRATIONS IN RESPIRABLE FRACTION SAMPLES COLLECTED AT PS-AM-12 AND PS-AM-13

SAMPLER NUMBER	MEAN	STANDARD DEVIATION	95% C. I. FOR MEAN	$\left(\frac{\text{PS-AM-12 MEAN}}{\text{PS-AM-13 MEAN}}\right) \times 100$	95% CI
LEAD $\mu g/m^3$					
PS-AM-12	0.0092	0.0095	0.0035 to 0.0150	59.7%	58.3% to 60.5%
PS-AM-13	0.0154	0.0156	0.0060 to 0.0248		
ZINC $\mu g/m^3$					
PS-AM-12	0.0150	0.0102	0.0091 to 0.0209	72.1%	70.6% to 75.2%
PS-AM-13	0.0208	0.0138	0.0121 to 0.0296		



LEGEND

- Air sampling
- Met station
- Tailings
- Migration zone

FIELD INVESTIGATIONS OF UNCONTROLLED HAZARDOUS WASTE SITES TASK REPORT TO THE E.P.A.	
TITLE: PROSPECTOR SQUARE Park City, Utah CONTAMINATED MIGRATION ZONE LOCATION MAP T.D.D. F08-8611-34G	
ecology & environment, inc. DENVER, COLORADO	FIG. 9
Date: 04/88 Drawn by: RSM Scale: 1" = 300'	